

REMARKS

Claims 46-65 are presently pending in this application. Claims 46-51 stand as originally filed without any amendments, and claims 52-65 were added to the application in the response dated March 15, 2004. None of the pending claims in the application have been amended.

The status of the Application in light of the Office Action dated September 23, 2004, is as follows:

- (A) Claims 46 and 52-55 were rejected under 35 U.S.C. § 102(b) over U.S. Patent No. 4,145,703 issued to Blanchard et al. ("Blanchard");
- (B) Claims 59-65 were allowed; and
- (C) Claims 47-51 and 56-58 were indicated as being allowable if rewritten in independent form to include all of the features of the respective base claims.

A. Response to Section 102(b) Rejections (Blanchard)

1. Claim 46

Claim 46 was rejected under 35 U.S.C. § 102(b) over Blanchard. Blanchard is cited for the proposition that this reference discloses a first layer 25B of silicon nitride disposed over at least a portion of a substrate, a second layer 26A of a second material (polysilicon) disposed over the first layer, and a third layer 28A of a third material (silicon dioxide). To support this rejection, the Examiner notes that the silicon nitride, silicon dioxide, and polysilicon layers inherently have different colors because they are made of different materials. However, as explained in more detail below, Blanchard does not teach all of the structural features of claim 46.

Claim 46 is directed to a microelectronic substrate assembly for use in controlling chemical-mechanical planarization processes. In one embodiment, the substrate assembly includes a first layer of a first material with a first color, a second layer of a second material with a second color over the first layer, and a sacrificial marker layer of a third material having a third color optically distinct from the first and second colors of

the first and second materials. The first layer has a first surface of a desired endpoint for planarizing the workpiece. The "surface" of the first layer is a structural feature of the device. The sacrificial marker layer marks a location in the film stack on the microelectronic substrate assembly. The sacrificial marker layer is also a structural feature that provides a significant advantage for endpointing CMP processes because the material of the sacrificial marker layer does not need to be used in the operation of the circuitry such that it can be selected primarily based on its distinctive color as opposed to its conductive, dielectric, heat transfer, chemical, or other physical properties.

Claim 46 is patentable over Blanchard because this reference fails to teach or suggest several features of claim 46. Blanchard, more specifically, fails to teach at least (a) a "first layer having a first surface defining a desired endpoint elevation for a planarizing cycle" and (b) "a sacrificial marker layer." Blanchard completely fails to teach forming its first layer 25B to have a surface at a desired endpoint elevation for a planarizing cycle. Additionally, each of the layers 25B, 26A, and 28A of Blanchard is a necessary component for the operation of the device in Blanchard, and thus none of these layers can be sacrificed in subsequent processes. Thus, Blanchard fails to disclose at least two features of claim 46.

Blanchard actually teaches away from having a first layer having a first surface defining a desired endpoint elevation for a planarizing cycle because Blanchard does not teach the removal of any layer necessary to define the MOS device which Blanchard discloses. The MOS device described in Blanchard includes a silicon nitride layer 25B over at least a portion of a substrate, a polysilicon layer 26A over the silicon nitride layer, and a silicon dioxide layer 28A. The polysilicon layer 26A is etched to form a conductive line that operates the transistor in Blanchard, and the silicon dioxide layer 28A protects the polysilicon layer 26A. A person skilled in the art would not consider the top surface of the silicon nitride layer 25B to be at a CMP endpoint because this would require removing the polysilicon layer 26A and silicon dioxide layer 28 from the wafer. Removing the polysilicon layer 26A and/or the silicon dioxide layer 28A would compromise the structure described in Blanchard. Accordingly, Blanchard teaches

away from a first layer of silicon nitride having a surface that defines a desired endpoint elevation.

Blanchard also teaches a way from having a sacrificial marker layer. As described above, the sacrificial marker layer marks a location in the film stack on the microelectronic substrate assembly. Additionally, the sacrificial marker layer does not need to be used in the operation of the circuitry and can be at least partially removed, or "sacrificed," during processing of the substrate. Blanchard does not disclose a sacrificial layer that "marks" a location for further processing or that can be sacrificed. Furthermore, if even a portion of either the protective silicon dioxide layer 28A and/or the conductive polysilicon layer 26A in Blanchard is removed, the operation of the MOS device would be compromised. Accordingly, Blanchard fails to teach or suggest a first layer having a first surface defining a desired endpoint elevation for a planarizing cycle and/or a sacrificial marker layer. For at least these reasons, claim 46 is patentable over Blanchard under Section 102 and 103.

In rejecting claim 46, the Examiner also asserts that the claim language, "the first layer having a first surface defining a desired endpoint elevation for a planarizing cycle" is a non-limiting statement of intended use and therefore gives no meaning to the claim. Additionally, the Examiner makes a similar assertion with regard to the term "a sacrificial marker layer," indicating that the terms "sacrificial" and "marker" are merely non-limiting statements of intended use having no meaning in relationship to the claim. These assertions fail to comply with the MPEP (see § 2173.05(g)), and cannot support a rejection under 35 U.S.C. §§ 102 or 103.

As discussed above, these terms define structural features, but even if they were purely functional terms, the Examiner must evaluate and consider the terms for what they fairly convey to a person of ordinary skill in the pertinent art in the context in which the terms are used. MPEP § 2173.05(g). Accordingly, the claim language "a first surface defining a desired endpoint elevation for a planarizing cycle" clearly defines a feature that is not taught or suggested by Blanchard. Similarly, the terms "sacrificial" and "marker" must be given a full import when reading the claim language, "a sacrificial

marker layer," and Blanchard also clearly fails to teach or suggest this feature. Accordingly, for at least these reasons claim 46 is patentable over Blanchard.

2. Claims 52-55

Claim 52 is directed to a microelectronic substrate assembly with a first layer of a first material having a first color, a second layer of a second material having a second color, and a sacrificial marker layer of a third material having a third color optically distinct from the first and second colors. The sacrificial marker layer is disposed between the first layer and the second layer. Conversely, Blanchard discloses a MOS device having a conductive polysilicon layer disposed between a silicon nitride layer and a silicon dioxide layer. As discussed above, the polysilicon layer is conductive and necessary for the operation of the MOS device in Blanchard.

As discussed above with reference to claim 46, Blanchard does not teach or suggest a first layer having a first color, a second layer having a second color, and third layer having a third color optically distinct from the first and second colors. Additionally, Blanchard does not support that each and every different material has a different color. For at least this reason, claim 52 is patentable over Blanchard.

Additionally, as discussed above with reference to claim 46, per Section 2173.05(g) of the M.P.E.P., the Examiner must evaluate and consider the terms "sacrificial" and "marker" in the claimed "sacrificial marker layer" for what it fairly conveys to a person of ordinary skill in the pertinent art in the context in which it is used. As discussed above with reference to claim 46, Blanchard does not teach or suggest a marker layer for marking a location in a film stack or a sacrificial layer which can be sacrificed during the processing of a substrate. In fact, Blanchard teaches away from such features. For example, the conductive polysilicon layer cannot be removed or "sacrificed" without compromising the operation of the MOS device. Accordingly, for at least these reasons, claim 52 is patentable over Blanchard. Because claims 53-55 depend from claim 52, they are also patentable over Blanchard.

B. Allowed Claims and Allowable Subject Matter

The applicant would like to thank the Examiner for allowing claims 59-65. In allowing claims 59-65, the Examiner states that U.S. Patent No. 5,433,651 issued to Lustig et al. ("Lustig") does not appear to teach using a first light pulse with a first frequency and a second light pulse with a second frequency during a planarization process. The Examiner goes on to state that Lustig shows using a single light source instead of two or more light sources. The applicant would like to clarify that claim 59 refers to a first light pulse having a first frequency and a second light pulse having a second frequency, but does not necessarily require two light sources. For example, claim 59 encompasses a single light source that generates two light pulses at different frequencies. The applicant would also like to note, as discussed above, the functional language "sacrificial" and "marker" must be evaluated and considered for what it fairly conveys to a person of ordinary skill in the pertinent art in the context in which it is used. Accordingly, applicant maintains that providing a microelectronic workpiece that includes, among other things, a sacrificial marker layer of a third material having a third color optically distinct from the first and second colors of the first and second materials also makes claim 59 patentable over Lustig.

The Examiner also indicated that claims 56-58 contain allowable subject matter and would be allowable if rewritten in independent form to include all of the features of their respective parent claims. More specifically, the Examiner states that claims 56-58 contain allowable subject matter because the applicant stated in the remarks filed September 2, 2004, that Blanchard does not disclose the third layer being red, black or white. The Examiner goes on to state that "[t]his observation, to be relevant to the patentability of the claims, must relate to the actual color of the third layer, that is, to the actual color of the layer of polysilicon; the color of this polysilicon layer does not depend on whether [or] not Blanchard, et al., or any other reference, discloses that color." The applicant would like to point out that, the standard of anticipation under 35 U.S.C. § 102 is whether a reference discloses each and every element of the claim. Blanchard neither discloses a sacrificial marker layer nor a sacrificial marker layer that is red,

black, or white. Accordingly, Blanchard fails to teach or suggest a sacrificial marker layer that is red, black, or white.

Furthermore, claims 56-58 depend from claim 52, discussed above, which is in condition for allowance. Because claim 52 is allowable, all the claims depending from claim 52 are allowable. Accordingly, claims 56-58 are in condition for allowance without being rewritten in independent form.

The Examiner also indicated that claims 47-51 contain allowable subject matter and would be allowable if rewritten in independent form to include all of the features of the respective parent claims. More specifically, the Examiner states that claims 47-51 are allowable based upon the applicant's statement that U.S. Patent No. 4,946,550 issued to Van Laarhoven ("Van Laarhoven") does not disclose that the resist is optically distinguishable from the underlying material. The Examiner goes on to state that the applicant, in remarks filed September 2, 2004, states that Van Laarhoven "does not disclose that its resist is a different color than the underlying layers,' and that 'resists are typically clear, transparent liquids' (page 9, lines 20-22), and '[that Van Laarhoven does] not describe [its resist] as being optically distinguishable from the underlying layers' (page 10, line 2)." The Examiner goes on to state that whether a layer is optically distinguishable from an underlying layer is a matter of observational fact, and does not depend upon whether or not any particular reference mentions that it is or is not. Although the Examiner did not reject claim 46 under 35 U.S.C. § 103 with reference to Van Laarhoven, the Examiner states that if there is a resist, suitable for use in Van Laarhoven, that is not optically distinct from silicon nitride and silicon dioxide, claim 46 would be rendered obvious.

Van Laarhoven fails to teach or suggest all the features of claim 46 and will not support a rejection under U.S.C. § 102 or U.S.C. § 103. For example, Van Laarhoven fails to disclose or suggest a marker layer on the substrate. As set forth in the present application, the marker layer is used to identify an elevation within the film stack on the substrate. The marker layer actually "marks" a physical location on and/or in the substrate. The marker layer can also be "sacrificed" such that its intended purpose is to

be removed from most of the wafer instead of performing an electrical function in the operation of the circuit. The photo resist in Van Laarhoven does not mark a level in the film stack of the substrate for subsequent processing. Moreover, as admitted by the Examiner, Van Laarhoven does not disclose color or transparency of its resist.

Claim 46 is also patentable over Van Laarhoven under Section 103 because a person skilled in the art would not be motivated to mark a portion of the film stack with a sacrificial layer having an optically distinct color from either silicon nitride or silicon dioxide based on the prior art. The only motivation to use a sacrificial marker layer that is optically distinct from the underlying layers comes from the application because the resist layer disclosed in Van Laarhoven is not used as a marker and it is not described as being optically distinguishable from the underlying layers. Because Van Laarhoven does not state anything with respect to marking an elevation on the wafer or the optical properties of its resist layer, a person skilled in the art would evaluate whether the material (a) is chemically compatible with the other materials in the substrate, (b) provides sufficient coverage, (c) has the proper chemistry for the development/wash process, and (d) has the desired properties for the exposure process for use in photolithographic processes. A person skilled in the art would not use their resist in Van Laarhoven to be a marker layer or to be optically distinguishable from the underlying layers because this would require further research to find such a photo resist or to make a custom resist. Such additional steps would require motivation that is not provided by Van Laarhoven. Accordingly, neither Van Laarhoven nor Blanchard, singularly or in combination, teaches or suggests all of the elements of claim 46 and claim 46 is in condition for allowance.

Because claim 46 is allowable, claims 47-51 are also allowable. Additionally, claim 47 is also allowable because Van Laarhoven does not teach or suggest that the third material of the sacrificial marker layer comprises an opaque resist material as described in claim 47. Furthermore, claims 47-51 are also allowable because Van Laarhoven does not teach or suggest that the third material of the sacrificial marker layer comprises an optical transmissive material (claim 48), the third material of the sacrificial marker layer comprises a red layer of material (claim 49), the third material of

the sacrificial marker layer comprises a black layer of material (claim 50), or the third material of the sacrificial marker layer comprises a white layer of material (claim 51). Accordingly, claims 46-51 are allowable and more specifically, claims 47-51 are allowable without being rewritten in independent form.

C. Conclusion

In view of the foregoing, the pending claims comply with 35 U.S.C. § 112 and are patentable over the applied art. The applicant respectfully requests reconsideration of the application and a Notice of Allowance. If the Examiner has any questions or believes a telephone conference would expedite prosecution of this application, the Examiner is encouraged to call the undersigned at (206) 359-3258.

Respectfully submitted,
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